INTRODUCTION

Recovery Unit Designation

The Coeur d'Alene Lake basin is one of 22 recovery units designated for bull trout in the Columbia River basin (Figure 1). Bull trout in the basin have probably been isolated for more than 10,000 years from fish in the rest of the Columbia River basin by Spokane Falls. Genetic analyses of tissue samples collected from bull trout in Medicine Creek in 1994 by the U.S. Fish and Wildlife Service indicated that these fish comprise a relatively unique stock, having evolved in isolation from other Columbia River basin bull trout for approximately 15,000 years since the Lake Missoula Bretz floods (Williams *et al*. 1994).

The Coeur d'Alene Lake Basin Recovery Unit (often called the Coeur d'Alene Recovery Unit in this chapter) is found within the area designated as the Columbia River distinct population segment and includes the Spokane River from Post Falls Dam to Coeur d'Alene Lake, the lake, and the entire lake drainage area. Two subbasins occur within the Coeur d'Alene Recovery Unit: the Coeur d'Alene and St. Joe Rivers. The largest tributaries that occur within these subbasins include the North Fork Coeur d'Alene River and South Fork Coeur d'Alene River in the Coeur d'Alene River subbasin and the St. Maries River in the St. Joe River subbasin. The Coeur d'Alene Recovery Unit represents a distinct and unique portion of the range of the species. Bull trout in the Coeur d'Alene Lake basin were addressed in a single problem assessment (PBTTAT 1998) developed for the *State of Idaho Bull Trout Conservation Plan* (Batt 1996).

Geographic Description

The Coeur d'Alene Recovery Unit (Figure 2) is located in four northern Idaho counties: Shoshone, Kootenai, Benewah, and Latah. Coeur d'Alene Lake is the principle water body in the basin and serves as the base elevation for the principle streams and rivers in the area. The lake is the second largest in Idaho. The cities of Coeur d'Alene (Kootenai County) and St. Maries (Benewah County)

are the most populated areas in the Coeur d'Alene Recovery Unit. Coeur d'Alene is located on the northernmost shoreline of Coeur d'Alene Lake, and St. Maries lies about 19 kilometers (12 miles) upstream of Coeur d'Alene Lake on the St. Joe River. The basin is approximately 9,946 square kilometers (3,840 square miles) and extends from Coeur d'Alene Lake upstream to the Bitterroot Divide on the border of Idaho and Montana. Range in elevation is 646 meters (2,120 feet) to more than 2,134 meters (7,000 feet) along the divide (NPPC 2001).

The Spokane River, the only surface outlet of Coeur d'Alene Lake, flows westerly from the northern end of the lake to its confluence with the Columbia River, 160.9 kilometers (100 miles) to the southwest (NPPC 2001). A series of falls on the upper Spokane River formed barriers to the post-glacial dispersal of fishes, such as the Pacific salmon and steelhead trout, from the lower Columbia River to the Coeur d'Alene Lake basin (Simpson and Wallace 1982).

Figure 1. Bull trout recovery units in the United States. The Coeur d'Alene Lake Basin Recovery Unit is highlighted.

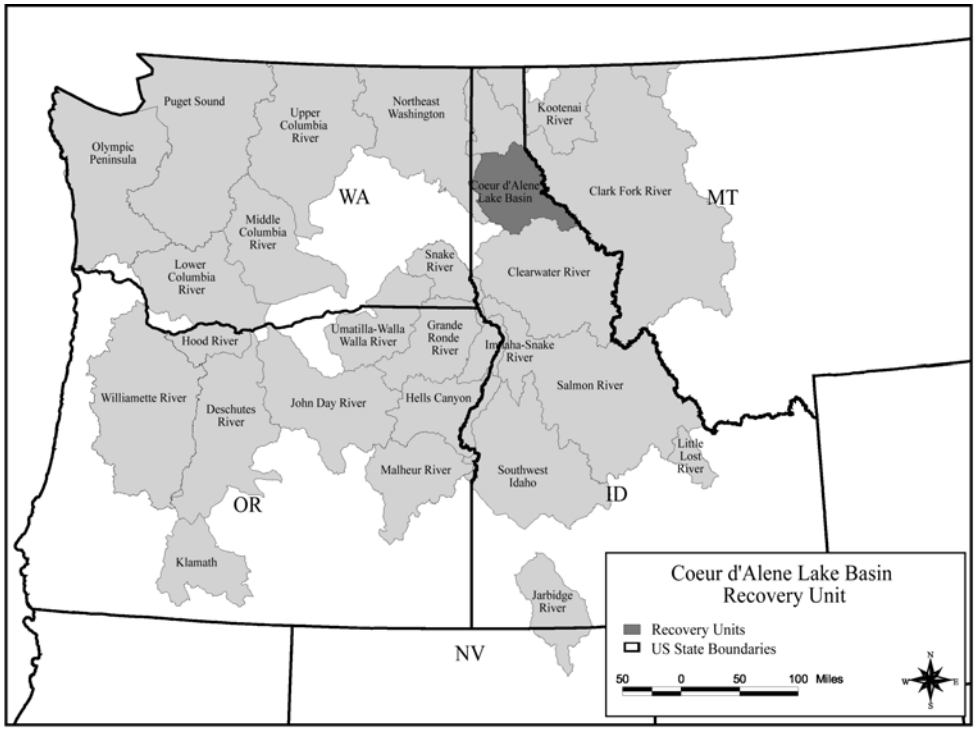
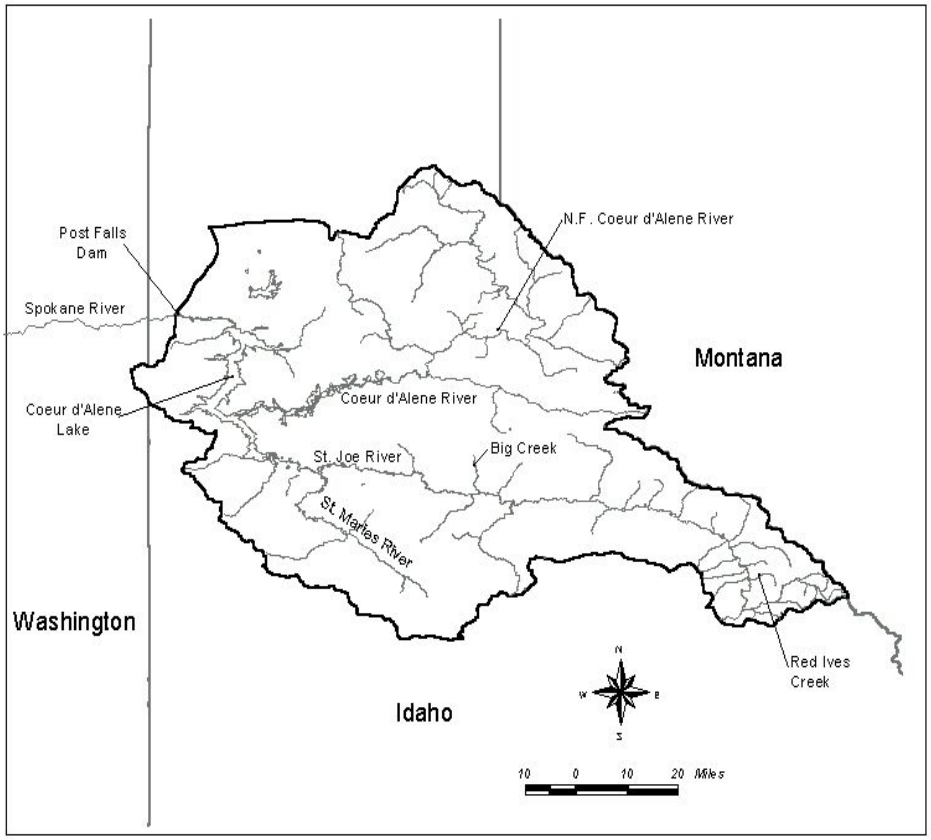


Figure 2. Map of the Coeur d'Alene Lake Basin Recovery Unit.



Major land managers within the basin include the U.S. Forest Service, Bureau of Land Management, State of Idaho, Coeur d'Alene Tribe, Louisiana Pacific Company, Crown Pacific International Corporation, and Potlatch Corporation. A portion of the basin lies within the boundaries of the Coeur d'Alene Indian Reservation. The U.S. Forest Service manages most of the land within the basin. The Idaho Department of Fish and Game and the Coeur d'Alene Tribe are managers of fish populations within the basin.

Northern Idaho is dominated by Pacific maritime air masses and prevailing westerly winds, modified by continental air masses from Canada (PBTTAT 1998). Annual precipitation in the Coeur d'Alene Recovery Unit

ranges from about 752 millimeters (30 inches) to more than 2,540 millimeters (100 inches), with over 90 percent of it occurring during fall through spring. Cyclonic storms consisting of a series of frontal systems moving west to east produce extended, low-intensity precipitation during this time. A seasonal snowpack generally exists at elevations greater than 1,372 meters (4,500 feet) during November to June. Snowpack under 914 meters (3,000 feet) tends to accumulate and melt several times during a given winter due to mild storms (USFS 1998a). Elevations of 914 to 1,372 meters (3,000 to 4,500 feet) are generally considered the "rain-on-snow zone" where watersheds are subject to floods caused by rapidly melting snow. High-intensity electrical storms are common during the summer months and frequently cause wildfires.

The underlying geology of much of the basin is primarily Belt meta-sediments, but the southern portion of the St. Joe River subbasin and the St. Maries River drainage have been modified or influenced by intrusions of the highly granitic Idaho Batholith (PBTTAT 1998). These intrusions have resulted in the formation of re-metamorphosed sedimentary rock that tends to be less stable than landforms based primarily on Belt meta-sediments.

The relatively rapid rate of mountain-forming uplifting, along with runoff associated with a moist climate, has resulted in larger streams and rivers adjusting by cutting deep canyons and valleys (PBTTAT 1998). Breaklands are a common land type in the St. Joe River and Coeur d'Alene River subbasins. Breaklands are typically steep and may be more susceptible to mass erosion in some areas. Alpine glaciation in the upper reaches of the St. Joe River and Coeur d'Alene River subbasins have resulted in alluvial valleys that may be important for bull trout. The St. Maries River drainage tends to be more rounded, and with less relief, than the reminder of the basin is. Streams in the drainage tend to be low gradient and meandering, with a high percentage of the bed and banks consisting of fine alluvial materials from ancient Lake Clarkia. The origins of Coeur d'Alene Lake are related to continental glaciation, and the lake provides the base elevation for the St. Joe River and Coeur d'Alene River subbasins. The lake was formed when a flooded river valley was impounded by deposits from the glacial Lake Missoula floods.

The lake lies in a naturally dammed river valley, and its outflow is currently controlled by Post Falls Dam. For part of the year, Post Falls Dam holds the lake level at higher elevations than would occur under natural conditions and creates a backwater effect in the lower Coeur d'Alene, St. Joe, and St. Maries Rivers. At full pool (lake elevation 648.7 meters, or 2128 feet) the lake covers 12,900 hectares (31,876 acres), and at minimum pool level (lake elevation of 646.2 meters, or 2120 feet) the lake covers 12,200 hectares (30,146 acres). The lake is 42 kilometers (26 miles) long and anywhere from 1.6 to 9.6 kilometers (1.0 to 6.0 miles) wide. The mean depth of the lake is 22 meters (72 feet), with a maximum depth of 63.7 meters (209 feet) (NPPC 2001).

Instream flows in the basin are typically low during late summer and early fall months and high in the spring and early summer. Runoff and peak discharge from Coeur d'Alene Lake generally occur from April to June, but the highest peak flows recorded are from mid-winter rain-on-snow events. Peak flows from the St. Joe and Coeur d'Alene Rivers have exceeded 1,415 cubic meters per second (50,000 cubic feet per second) and 1,982 cubic meters per second (70,000 cubic feet per second), respectively. Mean monthly discharges from both the St. Joe and Coeur d'Alene Rivers range from September lows of 11 to 14 cubic meters per second (400 to 500 cubic feet per second) to April and May highs of 198 to 227 cubic meters per second (7,000 to 8,000 cubic feet per second).

Many tributaries feed Coeur d'Alene Lake. The two principle tributaries are the Coeur d'Alene and St. Joe Rivers that drain the Coeur d'Alene and St. Joe mountains, respectively. The St. Joe River basin drains an area of approximately 4,470 square kilometers (1,726 square miles) and contains more than 1,189 kilometers (739 miles) of streams with over 78 principle tributaries. The Coeur d'Alene River basin drains an area of approximately 3,858 square kilometers (1,489 square miles) and contains an estimated 1,052 kilometers (654 miles) of stream with over 78 tributaries. In addition, over 27 tributaries encompassing more than 321 kilometers (over 200 miles) of streams feed directly into Coeur d'Alene Lake (NPPC 2001).

Water quality conditions vary widely in the Coeur d'Alene Lake basin. Water quality problems include high levels of heavy metals (lead, cadmium, and zinc) in the South Fork Coeur d'Alene River and many of its tributaries, high nutrient loading in portions of the lower St. Joe and St. Maries Rivers, and high sediment loads and temperatures in a number of streams throughout the basin (PBTTAT 1998). In total, over 85 water bodies that include streams, stream segments, rivers, and lakes within the Coeur d'Alene Recovery Unit are currently listed on the State of Idaho's 303(d) list of water quality impaired waters because of being water quality limited and not supporting their beneficial uses. However, many areas within the basin maintain good water quality conditions that fully support beneficial uses during the entire year or for major portions of the year. These areas include water bodies in the upper portions of the St. Joe and North Fork Coeur d'Alene Rivers, portions of the mainstem corridors in the St. Joe and North Fork Coeur d'Alene Rivers, and portions of Coeur d'Alene Lake.

Historical vegetation patterns were largely influenced by wildfire (PBTTAT 1998). Early accounts and photographs of the Coeur d'Alene Lake basin indicate that old growth stands of western red cedar (*Thuja plicates*) and other species were common in riparian areas and floodplains. Large cedar stumps are found in many riparian areas along streams in the Coeur d'Alene Lake basin. Uplands were more typically dominated by seral species in various stages of succession, with age and composition dependent largely on fire cycles and slope aspect.

Canopy tree cover varies along low-elevation riparian areas near tributary confluences (PBTTAT 1998). In areas with low or no canopy cover, vegetation includes shrubs and small trees such as thin-leaf alder (*Alnus sinuata*), willows (*Salix* species), snowberry (*Symphoricarpos albus*), mountain maple (*Acer glabrum*), red-osier dogwood (*Cornus stolonifera*), blue elderberry (*Sambucus cerulea*), and black hawthorn (*Crataegus douglasii*). Where tree canopy is present, tree species include black cottonwood (*Populus trichocarpa*) or water birch (*Betula occidentali*), quaking aspen (*Populus tremuloides*), and a mix of conifer species, such as western red cedar, western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), and western white

pine (*Pinus monticola*). White pine stands have been greatly reduced by white pine blister rust, an introduced pathogen.

Conifer forests in the basin consist of mixed stands of western red cedar and western hemlock; codominant Douglas-fir and ponderosa pine (*Pinus ponderosa*); and Douglas-fir, western larch (*Larix occidentalis*), lodgepole pine (*Pinus contorta*), and western white pine. Dense stands of Douglas-fir, larch, and lodgepole are characteristic of slopes with north and east aspects. Relatively open stands of Douglas-fir and ponderosa pine are typical on the warmer and drier slopes having south and west aspects.

Representative species of upland shrubs include western serviceberry (*Amelachier alnifolia*), mountain maple, snowberry, mountain balm (*Ceanothus velutinus*), mallow ninebark (*Physocarpus malvaceus*), and huckleberry (*Vaccinium* species).

Twelve native fishes inhabit the Coeur d'Alene Lake basin: northern pikeminnow (*Ptychocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), torrent sculpin (*Cottus rhotheus*), shorthead sculpin (*C. confusus*), speckled dace (*Rhinichthys osculus*), longnose dace (*R. cataractae*), longnose sucker (*Catastomus catastomus*), largescale sucker (*Ca. macrocheilus*), bridgelip sucker (*Ca. columbianus*), mountain whitefish (*Prosopium williamsoni*), westslope cutthroat trout (*Oncorhyncus clarki lewisi*), and bull trout.

Nonnative fishes in the basin include smallmouth bass (*Micropterus dolomieui*), largemouth bass (*M. salmoides*), crappie (*Pomoxis* species), sunfish (*Lepomis* species), yellow perch (*Perca flavescens*), brown bullhead (*Ameiurus nebulosus*), channel catfish (*Ictalurus punctata*), tench (*Tinca tinca*), northern pike (*Esox lucius*), tiger musky (*E. lucius x E. masquinogy*), brook trout (*Salvelinus fontinalis*), rainbow trout (*O. mykiss*), chinook salmon (*O. tshawytscha*), and kokanee (*O. nerka*). Many of these species can competitively exclude or replace bull trout in either stream or lake environments (Bond 1992; Ratliff and Howell 1992; Rieman and McIntyre 1993).

DISTRIBUTION AND ABUNDANCE

Status of Bull Trout at the Time of Listing

In the final listing rule (63 FR 31647), the U.S. Fish and Wildlife Service identified a single bull trout subpopulation in the Spokane River basin (USFWS 1998). The subpopulation contains migratory fish (fluvial and adfluvial) primarily spawning in tributaries of the upper St. Joe River. At the time of listing, the status of the subpopulation was considered depressed, and the trend was considered declining. The U.S. Fish and Wildlife Service considered nonnative species, grazing, roads, mining, residential development, water quality, and forestry to be threats to the bull trout subpopulation (USFWS 1998). The magnitude of threats was considered high and imminent. Although subpopulations were an appropriate unit upon which to base the 1998 listing decision, the recovery plan has revised the biological terminology to better reflect the current understanding of bull trout life history and conservation biology theory. Therefore, subpopulation terms will not be used in this chapter.

Current Distribution and Abundance

Bull trout are currently found primarily in the upper portions of the St. Joe River subbasin (PBTTAT 1998; USFWS 1998), which contains spawning and rearing habitats. Migratory bull trout also use the St. Joe River and Coeur d'Alene Lake for foraging, migrating, and overwintering habitat. The current distribution is substantially less than the historical distribution. For example, Fields (1935) and Maclay (1940) documented bull trout in over 30 streams and river reaches throughout the basin over 60 years ago. Bull trout have not been observed in many of these streams in recent years, and spawning and rearing appear to be concentrated in relatively few tributaries of the St. Joe River subbasin (USFWS 1998).

The North Fork Coeur d'Alene River and its tributaries encompass a relatively large portion of the Coeur d'Alene Recovery Unit. Within the North Fork Coeur d'Alene drainage, Maclay (1940) observed bull trout in eight creeks

(Grizzly, Brown, Beaver, Lost, Big, Downey, Yellow Dog, and West Fork Eagle Creeks), in addition to the North Fork Coeur d'Alene River. Bull trout were observed in Brown and Graham Creeks by Idaho Department of Fish and Game researchers from 1984 to 1987 (Apperson *et al.* 1988). In 1985, a single bull trout was caught in the main Coeur d'Alene River at the mouth of Cinnabar Creek (E. Lider, USFS, pers. comm., 2001). Anglers reported bull trout in Fall Creek in the early 1990's and in Prichard Creek in 1998 (D. Lowry, IDFG, pers. comm., 1998). However, neither additional surveys in these two streams (PBTTAT 1998), nor surveys of 73 other streams in the North Fork Coeur d'Alene River drainage from 1994 to 1995 (Dunnigan and Bennett 1997) confirmed the presence of bull trout. The origin of the bull trout observed in Prichard Creek may have been fish stocking in Revett Lake in the early 1990's; those fish may have moved downstream (PBTTAT 1998). In 1998, anglers caught two adult bull trout in Black Lake; the fish were verified through photo documentation (J. Fredericks, IDFG, pers. comm., 1998). Located in the lower portion of the Coeur d'Alene River subbasin, Black Lake is relatively small and deep and may provide coldwater refugia and a forage base for bull trout. In the 1970's, Laumeyer (1976) did not observe bull trout at 21 sites sampled within the North Fork Coeur d'Alene River drainage.

In the St. Joe River subbasin, the highest densities of bull trout are primarily found upstream of Heller Creek. Since 1992, redd surveys led by biologists from the Idaho Department of Fish and Game and the U.S. Forest Service, in up to 29 locations, has resulted in observations of redds in more than 20 stream and river reaches (Table 1). Overall, more than 70 percent of the bull trout redds were located upstream of Heller Creek, with over 50 percent occurring in a 3-kilometer (approximately 2-mile) reach of Medicine Creek (PBTTAT 1998). The Idaho Department of Fish and Game currently conducts annual bull trout redd surveys in three index streams within the St. Joe River subbasin (Medicine and Wisdom Creeks and the upper St. Joe River between Heller Creek and St. Joe Lake).

Table 1. Bull trout redds counted in the St. Joe River and tributaries from 1992 to 2001. (IDFG *in litt*. 1998, 2001; USFS *in litt*. 2001)

Stream	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Bean Creek	14	–	–	0	–	–	–	–	–	–
Beaver and Bad Bear Creeks	2	2	0	0	0	0	1	–	–	0
California Creek	2	4	0	2	3	0	–	–	0	0
Fly Creek	1	–	–	0	0	–	2	0	–	–
Gold Creek	–	2	–	0	1	1	0	0	–	1
Heller Creek	0	0	0	0	–	1	0	0	0	–
Medicine Creek	11	33	48	26	23	13	11	48	43	16
Mosquito Creek	0	–	0	0	4	0	2	–	–	–
North Fork Simmons Creek	–	0	1	0	–	–	–	–	–	–
Red Ives Creek	–	0	1	1	0	1	0	0	0	0
Ruby Creek	0	1	–	8	–	–	–	–	–	–
Sherlock Creek	0	3	0	2	1	1	0	–	0	–
Simmons Creek	–	7	5	0	0	0	1	–	0	0
Simmons Creek: Three Lakes Cr. to Washout Cr.	–	0	0	5	1	0	–	–	–	–
St. Joe River: Heller Cr. to St. Joe Lake	10	14	3	20	14	6	0	10	2	11
St. Joe River: Spruce Tree to Bean Creek	–	–	–	4	0	–	–	–	–	–
St. Joe River below Tento Creek	–	–	–	–	3	–	–	–	–	–
Timber Creek	–	0	1	0	–	–	–	–	–	–
Washout Creek	–	3	0	0	0	0	–	–	–	–
Wisdom Creek	1	1	4	5	1	0	4	11	3	13

Table 1. Bull trout redds counted in the St. Joe River and tributaries from 1992 to 2001. (IDFG *in litt*. 1998, 2001; USFS *in litt*. 2001)

Stream	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Yankee Bar Creek	1	0	–	–	–	0	–	–	1	0

Maclay (1940) documented bull trout in Sisters, Bluff, Boulder (a tributary of Marble Creek), Bruin, Quartz, and Mica Creeks. Recent surveys determined that spawning and rearing are unlikely in Bruin and Quartz Creeks and failed to document bull trout in Mica Creek during 1993 to 1994 (PBTTAT 1998). Two bull trout were observed during snorkel surveys conducted in summer 1974 in Mica Creek (Thurow and Bjornn 1978).

Although bull trout were not observed in Indian Creek by Maclay (1940) or during recent surveys, habitat conditions appear conducive to bull trout, and the creek's proximity to other spawning streams may encourage colonization (PBTTAT 1998). In 1997, two bull trout of about 140 millimeters (5.5 inches) in length were sampled in Eagle Creek (St. Joe River subbasin), suggesting occasional use or recruitment within the stream.

In the St. Maries River drainage, Fields (1935) and Maclay (1940) observed bull trout in Santa Creek. Recent surveys did not collect bull trout in any tributaries in the drainage (PBTTAT 1998; T. Cundy, Potlatch Timber Company, pers. comm., 2001). However, anecdotal reports from anglers indicate that bull trout may be present in the St. Maries River.

In 1996, the U.S. Forest Service completed aquatic habitat surveys in the federally managed portions of the North Fork St. Joe River drainage, and the Idaho Department of Environmental Quality and U.S. Forest Service conducted electrofishing surveys in selected areas (PBTTAT 1998). The U.S. Forest Service has also conducted infrequent bull trout redd surveys in the drainage since 1992. Given survey results, it is unlikely that the North Fork St. Joe River drainage presently supports bull trout. However, considering the relatively large size of the

drainage (29,203 hectares, or 72,160 acres) and its proximity to other spawning areas, bull trout may occasionally use the drainage.

While sampling error is likely during redd counts, Dunham *et al.* (2001) found that estimated adult escapement and redd counts were strongly correlated. Studies have shown that the number of bull trout per redd varies in different systems. Dunham *et al.* (2001) found a mean number of 2.8 adults per redd in Trestle Creek, Idaho, while Fraley *et al.* (1981) found an average of 3.9 adults per redd in the Flathead River basin, Montana. Using the results of these studies, with an average of 2.8 to 3.9 adult spawners per redd, along with data from redd counts conducted by the U.S. Forest Service and Idaho Department of Fish and Game from 1992 to 2001, the Coeur d'Alene Recovery Unit Team estimated the number of annual adult bull trout spawners in the St. Joe River and its tributaries at between 190 and 264. However, because comprehensive bull trout redd surveys on an annual basis are not being conducted in all tributary or river reaches where spawning activities have been previously documented and because some bull trout may exhibit alternate year spawning behavior (Shepard *et al.* 1984; Hvenegaard and Thera 2001), these population estimates may be low. Nonetheless, using the best available information to establish these estimates, using conclusions from theoretical models used by Rieman and Allendorf (2001) for maintaining genetic variability, and considering the risks related to stochastic and deterministic processes, the recovery unit team considers the population of bull trout within the Coeur d'Alene Recovery Unit to be seriously imperiled.

The Coeur d'Alene Recovery Unit Team maintains that occasional surveys do not demonstrate absence of bull trout in tributary streams. In most cases, such surveys are not rigorous and do not offer the best chances of observing low densities of bull trout. Therefore, even where occasional surveys have failed to document the presence of bull trout, if habitat parameters suitable for bull trout occupation are present, these areas may be considered candidates for restoration and at this time are considered essential for the recovery of bull trout within the Coeur d'Alene Recovery Unit. For these reasons, some streams may be added to or excluded from the list of priority streams when new information becomes available.

REASONS FOR DECLINE

Euro-Asian settlement of the basin has been accompanied by forest clearing, agricultural development, logging, introduction of nonnative species, mining and smelting, railroad construction, hydroelectric development, and urbanization (PBTTAT 1998). Forest products are an important commodity from timbered lands within the basin watershed. Present vegetation conditions have been influenced by all of these factors, as well as by natural and human-caused fires.

Forest fires have affected vegetation within the Coeur d'Alene Lake basin during the last century. A large fire in 1910 burned an estimated 1,214,100 hectares (3,000,000 acres) in western Montana and northern Idaho (PBTTAT 1998). The most severely burned areas were reportedly on the north and south slopes of the Bitterroot Mountains (Guth and Cohen 1991; Pratt and Huston 1993). Much of the Coeur d'Alene Lake basin lies within the Bitterroot Mountains.

Dams

Post Falls Dam, which was completed in the early 1900's, is operated by Avista Utilities (formerly Washington Water Power Company) and regulates water levels in Coeur d'Alene Lake (PBTTAT 1998). During most of the year, operation of Post Falls Dam also affects water levels in the lower reaches of the St. Joe and Coeur d'Alene Rivers. Regulation of water levels primarily influences aquatic habitat conditions at shoreline areas of the lake and lower reaches of lake tributaries and results in backwater areas.

The remnants of a historic structure for domestic water supply are still present in Red Ives Creek, a tributary of the St. Joe River (PBTTAT 1998). The structure may be inhibiting upstream fish movement, especially during base stream flows. A large bull trout was observed upstream of the structure during

snorkel surveys in 1993, indicating some bull trout may be able to pass above the structure. Modifying the structure may increase access of bull trout to Red Ives Creek.

In the past, splash dams were used in several streams (most notably Marble Creek in the St. Joe River basin) and created significant changes to stream channels and fish habitats by creating migration barriers and scouring channels with regular releases of large quantities of water and logs. Remnants of the Marble Creek splash dam are still present and continue to be a barrier to upstream migration (PBTTAT 1998).

Forest Management Practices

Forest management activities have altered aquatic and riparian habitats in the Coeur d'Alene Recovery Unit. Timber harvesting activities have included clear-cutting, partial cutting, thinning, fertilization, road construction, and prescribed burning (PBTTAT 1998). Removal of riparian vegetation has increased stream temperatures and contributed to elevated sediment levels in tributary streams. The legacy effects of forest management have resulted in streams having both low concentrations of large woody debris (for example, from riparian harvest and log skidding directly in streams) and low potential for recruitment of large woody debris. Early logging throughout the Coeur d'Alene Recovery Unit largely occurred in valleys where logs could be easily skidded or transported by flume to the river and ultimately floated to downstream mills. Splash dams were used in the North Fork Coeur d'Alene River, Little North Fork Coeur d'Alene River, and tributaries to the St. Joe River, such as Marble Creek. Current forest management practices have improved (for example, requiring that trees be left in riparian areas; prohibiting equipment in or near streams; and controlling erosion from roads, trails, and landings), so impacts have been lessened.

Roads for timber harvest and improved fire control have been built throughout most of this century and continue to be built in the Coeur d'Alene Lake basin (PBTTAT 1998). The effects on streams of roads built for timber

management and other development activities may include increases in sediment delivery because of surface runoff and landslides; barriers to fish passage at crossings; alteration of hydrologic regimes; and decreases in habitat complexity due to channelization, floodplain encroachment, and destruction of riparian vegetation. Areas with the highest density of roads occur in areas managed primarily for timber production, and roads paralleling tributary streams are common. Over half of the tributaries (second order streams and larger) in the St. Joe, St. Maries, and Coeur d'Alene River drainages have reaches that are affected by roads constructed in floodplains or adjacent to stream channels. Roads, many of which were initially constructed for timber harvest, run parallel to most tributary streams, with the exception of Independence Creek and portions of the upper North Fork Coeur d'Alene River (Dunnigan and Bennett 1997). Road densities in some Coeur d'Alene River watersheds exceed 11.8 kilometers per square kilometer (19.0 miles per square mile), with an average road density of 3.1 to 3.7 kilometers per square kilometer (5.0 to 6.0 miles per square mile) for many watersheds throughout the basin (PBTTAT 1998; USFS 1998a, 1998b). Many of the roads are not maintained (USFS 1998a) and contribute sediments to streams. Past timber harvest practices such as use of splash dams and log flumes, riparian timber harvest, and large clearcuts have altered stream channels and hydrologic regimes and have reduced recruitment of large woody debris.

Within the St. Joe River subbasin, effects of timber management practices on aquatic habitats are more prevalent in watersheds lower in the system than in watersheds in the upper portion, which currently supports bull trout. For example, legacy and current effects of timber management exist in the Sisters Creek, North Fork St. Joe River, Bluff Creek, and Boulder Creek watersheds. Bull trout were observed in these streams historically, but they have not been collected in recent surveys. In these watersheds there are private timberlands that have had extensive road construction and riparian timber harvest (PBTTAT 1998). Along the lower 6.4 kilometers (4 miles) of Bluff Creek, a road constructed adjacent to the stream has simplified stream channel habitats because of channelization and debris removal. Landslides related to poorly constructed roads in the 1970's have contributed to delivery of coarse and fine sediments, and a recently constructed road is responsible for substantial delivery of fine

sediments in Bad Luck Creek, a tributary in the Bluff Creek watershed (PBTTAT 1998).

Maclay (1940) observed bull trout in Beaver Creek, and relatively low numbers are known to presently spawn, rear, and overwinter in the creek (PBTTAT 1998). Recently, timber was harvested in areas consisting of sensitive soils, and roads constructed on unstable slopes are experiencing rotational slumps and hillslope failures. These slumps were first detected in 1997 and have increased sediment delivery. Areas of slope instability are expected to increase (PBTTAT 1998).

Livestock Grazing

Livestock grazing is generally confined to the valley bottoms of the lower rivers in the Coeur d'Alene Recovery Unit (PBTTAT 1998). After wildfires in 1910 and the 1930's, grazing allotments were established on portions of U.S. Forest Service lands. Large numbers of sheep were historically grazed in the basin, but the practice is presently infeasible due to plant succession. Cattle grazing allotments exist in portions of the Coeur d'Alene River subbasin and the St. Maries River drainage. The U.S. Forest Service and outfitters graze pack and saddle stock at localized areas within the Coeur d'Alene Recovery Unit. Grazing also occurs on private ranches that are found primarily in the valley bottoms. Livestock grazing may impair water quality; increase water temperatures; and reduce aquatic habitat complexity through stream widening, stream depth reductions, and bank sloughing (Armour *et al.* 1991; Platts 1991). Although grazing along the St. Maries River and some tributaries may be inhibiting succession of riparian vegetation that would improve stream shade and bank stability, livestock grazing is not thought to be a major factor contributing to decline of bull trout in the Coeur d'Alene Recovery Unit.

Agricultural Practices

Agricultural practices affecting aquatic habitats in the Coeur d'Alene Recovery Unit include row-crop cultivation, modification and removal of riparian

vegetation, and dike construction and establishment of drainage districts that modify floodplains (PBTTAT 1998). Agricultural activity occurs mainly in the valleys of the lower Coeur d'Alene, St. Joe, and St. Maries Rivers, as well as in the Palouse Region where streams draining from the southwest enter Coeur d'Alene Lake.

Agriculture practices such as crop production can affect water quality and aquatic habitats by increasing nutrient levels from fertilizers, chemical concentrations from pesticides, and sedimentation from bank and channel alterations and by reducing riparian vegetation (PBTTAT 1998). Drainage districts along the lower St. Joe and Coeur d'Alene Rivers have reduced floodplain capacity and habitats accessible to fish. The primary effect of crop production has been increased sedimentation.

Transportation Networks

The transportation network in the Coeur d'Alene Lake basin includes both railroad lines and roadways. Two major railroad lines were constructed along the South Fork Coeur d'Alene River, mainstem Coeur d'Alene River, and some tributaries in the late 1800's (PBTTAT 1998). Construction included channelization of streams along the lines. In the early 1900's, the Milwaukee Railroad was built along the mainstem St. Joe River and extended up the North Fork St. Joe River. A spur line to the Milwaukee Railroad was built along the St. Maries River. Construction of the line created several fish migration barriers, channelized streams, and placed large fill areas across tributaries. Today, only the St. Maries River Railroad, along the St. Maries River and lower St. Joe River, is in use. Although much of the railway system has been abandoned, legacy effects of the lines still exist, primarily in the form of unmaintained fill areas, channelized streams, and passage barriers. For example, a fill area for the Milwaukee Railroad on Loop Creek, a tributary to the North Fork St. Joe River, failed in 1995. An estimated 45,900 to 61,200 cubic meters (60,000 to 80,000 cubic yards) of both fine and course sediments were released into Loop Creek and the North Fork St. Joe River (PBTTAT 1998). Decades may be required before

equilibrium can be reestablished when large quantities of course sediment are released.

The road system in the Coeur d'Alene Recovery Unit includes Interstate 90, five State highways, numerous County and municipal roads, and an extensive road network that was initially constructed for forest management but that is now used primarily for access to recreational opportunities (PBTTAT 1998). The first major developed roadway was Mullan Road, which was constructed in the mid-1800's along the South Fork Coeur d'Alene River for military uses. Paved highways currently parallel large portions of the North Fork Coeur d'Alene, South Fork Coeur d'Alene, St. Joe, and St. Maries Rivers. The effects on aquatic habitats of roads directly adjacent to streams are similar to the effects of railroad lines: constrained channel meanders, reduced floodplain capacity, and reduced or eliminated riparian vegetation and recruitment of large woody debris. Streamside roads are also vulnerable to failure during high flows and are sources of sediment to stream channels.

In the St. Joe River subbasin, the construction of Highway 50 resulted in channelization of the mainstem St. Joe River, and numerous crossings at tributaries are barriers to fish migration (PBTTAT 1998). Road densities in upper portions of the watershed, such as upstream of the confluence with Heller Creek (less than 10 percent of the subbasin), are typically under 0.4 kilometers per square kilometer (0.6 miles per square mile). However, several U.S. Forest Service roads (for example, 320, 218, and 187) are adjacent to portions of tributary streams and may negatively affect aquatic habitats, form passage barriers, and provide angler access to bull trout spawning areas. Sediment generated by these roads are not presently considered a primary factor in the decline of bull trout because of their remote location and seasonal use restricted by snow levels.

Road densities vary in the mid and lower portions of the St. Joe River subbasin (PBTTAT 1998). Much of the North Fork St. Joe River watershed is roadless; however, other areas have relatively high road densities. Overall road density is 0.9 kilometers per square kilometer (1.5 miles per square mile)

throughout the entire watershed. In contrast, the St. Joe River subbasin from Bird Creek to Bruin Creek has a road density of 2.9 to 4.4 kilometers per square kilometer (4.7 to 7.1 miles per square mile). Additional road construction is planned in some watersheds, and road obliteration has been conducted or is planned in other areas.

Mining

Mining activities, primarily for precious metals, gemstones, and aggregates have contributed to aquatic and riparian habitat degradation and impaired water quality in Coeur d'Alene Lake and portions of the Coeur d'Alene River and St. Joe River subbasins (PBTTAT 1998). In addition, past and present mining activities inhibit growth of riparian vegetation, a condition that reduces stream shading and increases water temperature. In the Coeur d'Alene River subbasin, precious metals were discovered in the 1880's, and subsequent mining activities and associated development (for example, milling and smelting operations, riparian timber harvest, dam construction and stream channelization, and construction for transportation) substantially altered the floodplain and aquatic habitats. Aquatic conditions were and continue to be unsuitable for resident fishes and other aquatic life in the South Fork Coeur d'Alene River and mainstem Coeur d'Alene River downstream to Coeur d'Alene Lake, primarily because of mine pollution (Ellis 1932; Dixon 1999; Rahel 1999; Reiser 1999). In addition, Coeur d'Alene Lake currently exceeds ambient water quality criteria (AWQC) for lead, zinc, and cadmium at various times during a typical year and is not fully protective of aquatic life.

After review of all available data, Rahel (1999) concluded that fish populations downstream of Canyon Creek in the South Fork Coeur d'Alene River showed a clear spatial pattern of being reduced when compared with the population level further upstream, as well as population levels in a reference stream (the St. Regis River, Montana). This observation includes reduced abundance of trout and the absence of native sculpin species and mountain whitefish. Rahel also concluded that the alteration of the fish community is most closely associated with metals, rather than with changes in other habitat features.

He based this conclusion on the fact that no other water quality or physical habitat features can explain the spatial pattern of severely reduced fish abundance. Reiser (1999) found that wild trout populations in Nine Mile Creek, Canyon Creek, and the South Fork Coeur d'Alene River are controlled by elevated metal concentrations. Dixon (1999) concluded that there is clear evidence that metals are causing injury to fish in the Coeur d'Alene River subbasin. He also concluded that there is substantial evidence of direct lethal and sublethal toxicity to fish in the Coeur d'Alene River subbasin and that fish populations are reduced in areas of the basin exhibiting elevated levels of metals, consistent with exposure to those metals.

Degraded stream conditions persist in the Coeur d'Alene River subbasin, as evidenced by high bedload deposition, channel braiding, and intermittent flow in stream and river reaches. Toxic effects of heavy metals liberated during mining and from existing mine wastes probably formed barriers to bull trout migration between Coeur d'Alene Lake and spawning and rearing habitats in Coeur d'Alene River tributaries. The largest superfund site in the nation (Bunker Hill) is located in the South Fork Coeur d'Alene River drainage near Kellogg. Although some fishes are presently using previously uninhabitable reaches of the South Fork Coeur d'Alene River, heavy metal contamination continues to exclude fish in some reaches of the lower portion of the river.

Woodward (1999) concluded that the water column concentrations of cadmium and zinc in the Coeur d'Alene River will reduce survival, growth, and abundance of fish. He also concluded that fish feeding on invertebrates in the river below locations of mine waste release have a diet source with elevated metals and are therefore at risk of reduced fitness.

In the North Fork Coeur d'Alene River drainage, placer mining has substantially degraded stream channels and floodplains in the Prichard Creek and Beaver Creek watersheds (PBTTAT 1998). Maclay (1940) documented that mining pollution from the Jack Waite mine in the upper portion of East Fork Eagle Creek created conditions unsuitable for fish.

CH2M HILL and URS Corp. (2001) determined that, because bull trout and westslope cutthroat trout were evaluated on an individual level due to their coverage under the Endangered Species Act and because toxicity can occur at levels below the ambient water quality criteria, there may be areas where the ambient water quality criteria is not protective of these species. This situation is most likely in areas where water hardness is low. Researchers from the two companies also concluded that, based upon comparisons of metals concentrations and acute ambient water quality criteria, surface waters are commonly lethal to some aquatic life in the following areas: upper Beaver Creek; Big and Canyon Creeks; portions of Ninemile, Pine, and Prichard Creeks; the entire South Fork Coeur d'Alene River; and the Coeur d'Alene River downstream to Harrison. Using the chronic ambient water quality criteria, researchers determined that growth and reproduction of surviving aquatic life would be substantially reduced in the following areas: Big Creek; portions of Canyon, Ninemile, Pine, and Prichard Creeks; the entire South Fork Coeur d'Alene River; and the Coeur d'Alene River downstream to Harrison.

Several areas in the St. Joe River subbasin were historically mined, and activities continue in some areas. Habitats in some streams of the upper St. Joe River subbasin where bull trout currently occur are degraded by historical mining activities. For instance, habitat complexity has been reduced by stream channelization and loss of large woody debris in Sherlock Creek, a tributary to Heller Creek, and in the lower 0.8 kilometers (0.5 miles) of Heller Creek (PBTTAT 1998). The effects of historical mining (tailings and habitat degradation) continue to affect streams occupied by bull trout in tributaries to the St. Joe River in the reach upstream from Heller Creek (for example, Medicine, Wisdom, California, and Yankee Bar Creeks) and in the reach from Copper Creek to Bean Creek (for example, Bean, Ruby, and Timber Creeks). Mining activities continue in Sherlock Creek.

In the St. Maries River drainage, a large garnet placer mine operated since the 1940's has substantially altered habitats in Emerald and Carpenter Creeks (PBTTAT 1998). Mining operations continue in these tributaries, and a new mine for garnet has been proposed for a 5.1-kilometer (3.2-mile) reach of the St. Maries

River between the tributaries. Recreational garnet digging is also allowed on a tributary to the East Fork Emerald Creek at a U.S. Forest Service-managed dig site.

Stone, sand, and gravel (aggregates) are mined for local use, primarily for road construction and surfacing (PBTTAT 1998). Several aggregate sources are located within the basin, and in some cases, aggregate mining is used in conjunction with stream stabilization projects to reduce bedload transport and accumulation in low-gradient stream reaches.

Recreational suction dredging is conducted under permits issued by the Idaho Department of Water Resources with input from the Idaho Department of Fish and Game. Dredging seasons are established to minimize the risk to incubating trout eggs and recently hatched alevins and are specific to the water body. In tributaries known to be important for bull trout and westslope cutthroat trout spawning, an applicant must go through a more comprehensive permitting process before being allowed to operate a suction dredge.

Residential Development and Urbanization

Prior to the establishment of municipal waste treatment facilities in the Coeur d'Alene Lake basin, large quantities of phosphates and nitrogen contributed to nutrient enrichment of Coeur d'Alene Lake (PBTTAT 1998). Aquatic habitats in the Coeur d'Alene River subbasin have been negatively affected by residential development and transportation networks that were initially constructed to support mining operations. For example, the construction of dikes and transportation corridors in the South Fork Coeur d'Alene River and lower reach of the Coeur d'Alene River has altered the floodplain and prevented fish access to some tributaries. Negative effects of residential development on habitats in the North Fork Coeur d'Alene River are expected to increase as planned subdivisions are developed.

Fisheries Management

For over 50 years, the Idaho Department of Fish and Game has stocked and managed Coeur d'Alene Lake for nonnative species (PBTTAT 1998), with kokanee being introduced in 1937 and chinook salmon in 1982. Kokanee are relatively abundant in the lake and are probably an important forage item for adfluvial bull trout. Chinook salmon may be negatively affecting bull trout in Coeur d'Alene Lake directly through predation on young bull trout or indirectly through competition for food (*i.e.*, kokanee, westslope cutthroat trout, and whitefish). There are no data describing the interactions of these species in the lake.

Northern pike were introduced in the Coeur d'Alene Lake basin, probably during the 1970's (PBTTAT 1998). They have become established primarily in bays, smaller lakes, and slow-moving river reaches. Because northern pike are known to consume large numbers of migratory westslope cutthroat trout, they may also prey on bull trout that migrate into Coeur d'Alene Lake.

In the early 1900's, brook trout were introduced by management agencies throughout the Coeur d'Alene Recovery Unit (PBTTAT 1998). In the Coeur d'Alene River subbasin, brook trout are established in several tributaries, lakes, and reaches of the South Fork Coeur d'Alene River. Brook trout are also present in the North Fork Coeur d'Alene River drainage, but, generally, they are not abundant or widely distributed. In the St. Joe River subbasin, brook trout have been sampled at numerous sites throughout the North Fork St. Joe River drainage and are common in several tributaries of the lower St. Joe River (Apperson *et al.* 1989). Brook trout occur in most tributaries in the St. Maries River drainage.

Historically, overharvest of bull trout in the Columbia River basin probably contributed to their decline. Harvest may have included legal recreational angling, poaching, and State-sponsored eradication programs (Thomas 1992). Bull trout were often targeted for removal by anglers and government agencies through bounties because they preyed on salmon and other species desirable for sport fishing (Simpson and Wallace 1982; Bond 1992).

Recognizing the decline of bull trout, State management agencies in Idaho, Montana, Washington, and Oregon suspended harvest in the Columbia River basin except in a few limited locations. State fishing regulations still allow for the harvest of other salmonid species in most bull trout waters, as well as the incidental catch and release of bull trout by anglers fishing for other species.

Within the Coeur d'Alene Recovery Unit, bounties on bull trout were not known to have been prevalent and are not considered to have contributed to bull trout decline. However, the taking of bull trout of any size was encouraged by resource managers with a year-long open season (Fields 1935), and bull trout may have been considered an unfavorable species by anglers and targeted for removal for personal reasons. Current angler-related threats to bull trout can occur through harvest because of misidentification and poaching (PBTTAT 1998). For the Coeur d'Alene Lake basin, angling regulations were instituted in 1988 to prohibit harvest of bull trout; however, incidental hooking mortality may still occur while anglers fish for other species.

Isolation and Habitat Fragmentation

Barriers to bull trout migration that were created by transportation networks and mining operations are common in the Coeur d'Alene Lake basin (PBTTAT 1998). Culverts at road crossings of streams may pose barriers to bull trout passage. For example, construction of Highway 9 in the North Fork Coeur d'Alene River drainage created migration barriers at the mouths of several tributary streams. The Milwaukee Railroad line and Highway 50 have numerous crossings over lower St. Joe River tributaries that may be migration barriers to bull trout.

Primarily in the Coeur d'Alene River subbasin, tailing dams and waste discharges of chemicals from mining operations created barriers to bull trout migration in the past and may contribute to current seasonal migration barriers. Overall, the effects of these activities have been the fragmentation of some suitable bull trout habitats and isolation of bull trout within confined areas. However, the Comprehensive Environmental Response, Compensation, and

Liability Act (CERCLA) and other clean-up activities in the South Fork Coeur d'Alene River drainage and the mainstem Coeur d'Alene River are expected to improve water quality and habitat conditions within the lower Coeur d'Alene River migratory corridor.

Another factor that may have potentially fragmented suitable bull trout habitat is the near-eradication of beaver in the Coeur d'Alene Lake basin (PBTTAT 1998). Although there is no literature specifically relating bull trout to stream conditions created by beaver dams, bull trout evolved in the presence of beaver. Beaver dams have both positive and negative effects on stream salmonids. The relation between reductions in beaver and declines of bull trout in the Coeur d'Alene Lake basin is uncertain.

Currently, though no physical barriers exist and probably only seasonal or periodic instances occur when water quality potentially limits migration of bull trout through migratory corridors within the recovery unit, there is no evidence that bull trout from the St. Joe River subbasin readily access the Coeur d'Alene River subbasin to recolonize. Because bull trout exhibit a high degree of natal stream fidelity throughout their range (James *et al*., *in litt*., 1998; Spruell *et al.* 2000; Hvenegaard and Thera 2001) and because the current population size in the portion of the Coeur d'Alene Recovery Unit that is outside the lake and the St. Joe River is very small, the Coeur d'Alene River subbasin could be considered functionally fragmented from bull trout in the St. Joe River. This portion will probably not be recolonized naturally at any time during the expected time frames of the recovery plan.

ONGOING RECOVERY UNIT CONSERVATION MEASURES

The Idaho Department of Fish and Game is charged with "preserving, protecting, and perpetuating" Idaho's fish and wildlife resources for present and future generations and is the State agency responsible for managing fish and wildlife populations in the Coeur d'Alene Lake basin. The Idaho Department of Fish and Game developed and has updated a fisheries management plan for the basin on a five-year review cycle beginning in 1981. The fisheries management policies of the agency emphasize providing diverse sport fishing opportunities while also conserving wild, native fish stocks.

Portions of the upper St. Joe River subbasin and the North Fork Coeur d'Alene River drainage are managed as catch-and-release fisheries. A fishing regulation for single, barbless artificial fly and lure only is in effect in these portions of the basin. Bait fishing with limited harvest levels is allowed in other (middle to lower) portions of both river systems. In 1988, the harvest of bull trout was eliminated in the entire Coeur d'Alene Lake basin.

In 1996, the State of Idaho completed a bull trout conservation plan (Batt 1996). Coeur d'Alene Lake and its tributaries were designated as a key watershed for bull trout. The plan directed that problem assessments and conservation plans be developed for each of the key watersheds. In 1998, a bull trout Technical Advisory Team, consisting of State, Tribal, Federal, and private industry scientists, released the draft *Coeur d'Alene Lake Basin Bull Trout Problem Assessment* (PBTTAT 1998).

Since time immemorial, the Coeur d'Alene Tribe has protected, preserved, and managed the fish and wildlife resources in the Coeur d'Alene Lake basin. Currently, the Coeur d'Alene Tribe manages all fisheries within the Coeur d'Alene Reservation, including the southern third of Coeur d'Alene Lake, which is owned by the Coeur d'Alene Tribe. The Tribe has had a fisheries program since 1990 and has been conducting surveys, population estimates, and other

fisheries activities since 1992. In 1998, the Coeur d'Alene Tribe published updated fishing regulations for the Coeur d'Alene Reservation that are specific to the management goals of the Coeur d'Alene Tribe.

All streams on the Coeur d'Alene Reservation, as well as Coeur d'Alene Lake itself, are managed for native species through fishing regulations and habitat enhancement projects. Management emphasis is placed on westslope cutthroat trout and bull trout. In addition, the Coeur d'Alene Reservation has been closed to bull trout harvest since 1995. Since the early 1990's, the Coeur d'Alene Tribe Fisheries Program has been constructing sediment basins within various watersheds to decrease sediment loading to streams, planting riparian areas to improve cover and shading, installing instream habitat structures to improve the pool to riffle ratio, and installing structures for streambank realignment.

The Coeur d'Alene Tribe has developed a management plan to enhance resident fish resources within the Coeur d'Alene Reservation. This document summarizes all assessment information collected from studies in waters of the Coeur d'Alene Reservation and identifies goals, objectives, and strategies for the Coeur d'Alene Tribe's Fisheries Program. It outlines a conceptual approach for enhancement activities and provides uniform instructions for planning, implementing, monitoring, and evaluating these activities. The Coeur d'Alene Tribe works with private landowners and other agencies to implement riparian corridor enhancement activities. The Tribe also coordinates all of its natural resource programs to effectively manage all of its resources. For instance, one of the main goals of the Tribe's Wildlife Program is to acquire key pieces of wildlife habitat such as riparian corridors. These riparian corridors will also provide potential habitat for native fish species such as bull trout. A wildlife habitat management plan for the Coeur d'Alene Reservation is also currently under development within the Tribe's Wildlife Program. In addition, the Coeur d'Alene Tribe has adopted water quality standards to begin to address water quality impaired streams, as well as nonpoint source and point source pollution problems, on the Coeur d'Alene Reservation.

The Bonneville Power Administration has committed to protecting and enhancing native fish and wildlife habitats within the Coeur d'Alene Lake basin as a means of partially mitigating the impacts of the Columbia River Hydroelectric System (NPPC 2001). Wildlife mitigation efforts in the Coeur d' Alene Lake basin are intended to 1) provide partial mitigation for the extirpation of anadromous fish resources from the upper Columbia River basin and 2) provide partial mitigation for wildlife habitat losses attributable to the construction and operation of Albeni Falls Dam.

Partial mitigation for extirpated anadromous fisheries will be accomplished through continued implementation, operation, and maintenance of protection, mitigation, and enhancement efforts targeting key fish and wildlife habitats throughout the Coeur d' Alene Lake basin.

The Bureau of Land Management administers several small, isolated tracts in northern Idaho, and management emphasis is directed at water-based recreation. Conservation involvement in the basin includes 1) continued work with cooperating agencies and the public to eliminate undue degradation of existing and/or potential bull trout populations and habitats, 2) cooperative work to improve bull trout habitat on public lands, and 3) continued efforts to remove mining waste within the South Fork and North Fork Coeur d'Alene River systems to improve water quality.

A Conservation Partnership consisting of the local Soil and Water Conservation Districts, the Idaho Soil Conservation Commission, and the Natural Resources Conservation Service has been established to assist private landowners with the management of their natural resources. As a whole, the focus of the Conservation Partnership is to reduce nonpoint source pollution from agricultural lands by increasing the voluntary implementation of agricultural best management practices on various agricultural lands. The goal of best management practices is to reduce the amount of sediment, nutrients, pesticides, and bacteria reaching Coeur d'Alene Lake and its tributaries.

The Natural Resources Conservation Service has a number of programs within the Coeur d'Alene Lake basin that assist landowners with conservation improvements that focus on soil erosion control, water quality improvements, and wildlife habitat development. These include Conservation Technical Assistance, Wetlands Reserve Program, Environmental Quality Incentives Program, Wildlife Habitat Improvement Program, and Forestry Incentives Program. In addition, the Farm Services Agency administers the Conservation Reserve Program in the basin.

The Kootenai-Shoshone Soil and Water Conservation District has an updated five year plan (NPPC 2001). This plan lays out the goals, objectives, and actions that the Soil and Water Conservation District intends to undertake during the next five years. Water quality improvements are a top-priority goal, with an objective of accelerating the implementation of best management practices. The focus will be on assisting private landowners with controlling soil erosion on highly erodible croplands, streambanks, and other critical areas. Specific targets include the Lake Creek watershed, the lower Coeur d'Alene River, Latour Creek, and stream segments on the 303(d) list that have agricultural impacts. Efforts will be made to provide direct technical assistance to private landowners to help them improve natural resource management on their private lands. The Soil and Water Conservation District carries out its programs through the efforts of its own staff and also through cooperative agreements with other State and Federal agencies.

The U.S. Fish and Wildlife Service has responsibility for the protection of migratory birds and threatened and endangered species of fish, wildlife, plants, and their habitats within the Coeur d'Alene River subbasin. As a participant in the Coeur d'Alene Basin Natural Resource Damage Assessment, the U.S. Fish and Wildlife Service has been responsible for determining and documenting injury to fish, wildlife, plants, and their habitats from heavy metal-laden sediments. The U.S. Fish and Wildlife Service has, and continues to be, a participant in restoration planning and implementation activities based on injury documentation.

The Environmental Protection Agency is responsible for completing remedial activities associated with the Bunker Hill Superfund Site in the South Fork Coeur d'Alene River drainage. This responsibility includes removing contaminated sediments from the site to create conditions protective to the environment and its inhabitants. The Environmental Protection Agency is also in the process of developing a Proposed Plan for the clean up of all contaminants within the Coeur d'Alene Lake basin.

The U.S. Forest Service manages over half of the Coeur d'Alene Lake basin as part of the Idaho Panhandle National Forests. The 1987 *Forest Plan* (USFS 1987) for the Idaho Panhandle National Forests is the primary document that guides Federal forest management in the basin. The Inland Native Fish (INFISH) interim strategy was adopted in 1996 by the U.S. Forest Service to protect habitat for bull trout, westslope cutthroat trout, and other species associated with streams and riparian areas. All projects on the Idaho Panhandle National Forests are required to comply with INFISH guidelines, which include mandatory setbacks from streams unless site-specific management criteria for improving these habitats are met. Watershed restoration projects have been completed in both the Coeur d'Alene and St. Joe River subbasins. Efforts have also been undertaken to reduce mining impacts on U.S. Forest Service lands. Specifically, work has been done on the Silver Crescent Mine and Mill Complex located on East Fork Moon Creek in the South Fork Coeur d'Alene River drainage to reduce the release, and threat of release, of hazardous substances from this site (Ridolfi Engineers and Associates, Inc., 1996). The U.S. Forest Service has also worked to improve spawning habitat for fish in Prichard Creek on the North Fork Coeur d'Alene River.

The Idaho Department of Lands enforces the Idaho Forest Practices Act, which regulates commercial timber production and harvest on State and private lands within the basin. The Idaho Forest Practices Act contains guidelines to protect fish-bearing streams during logging and other forest management activities. The guidelines address stream buffers and riparian management, road maintenance and construction standards, as well as other topics. The Idaho Department of Lands assists private landowners in developing timber

management plans so that they comply with site-specific best management practices. In addition, the Idaho Department of Lands is responsible for administering mining laws and the State of Idaho Lake Protection Act and holds regulatory authority for lake shoreline developments for the northern portion of Coeur d'Alene Lake.

The Idaho Department of Environmental Quality has been developing subbasin assessments of water quality and total maximum daily loads (TMDL), where appropriate, for each of the stream segments of fourth hydrologic unit code (HUC) in the Coeur d' Alene Lake basin. The water pollutants addressed in these assessments and total maximum daily loads are trace (heavy) metals, plant growth nutrients, bacteria, and sediment. The Idaho Department of Environmental Quality, along with other agency representatives, has put together and is implementing the Lake Management Plan. This plan includes efforts to improve the aquatic habitat for fish species, including bull trout. The focus of the plan is nutrient management.

The Idaho Department of Environmental Quality administers several Federal Clean Water Act programs designed to monitor, protect, and restore water quality and aquatic life uses. These programs include the Beneficial Use Reconnaissance Program monitoring; 305(b) water quality assessments; 303(d) reports of impaired waters and pollutants; total maximum daily load assessments, pollutant reduction allocations, and implementation plans; 319 nonpoint source pollution management; antidegradation policy; water quality certifications; municipal wastewater grants and loans; National Pollutant Discharge Elimination System inspections; water quality standards promulgation and enforcement; general ground water monitoring and protection; source water assessments; and specific watershed management plans identified by the legislature. The Idaho Board of Environmental Quality oversees direction of the agency to meet responsibilities mandated through Idaho Code, Executive Orders, court orders, and agreements with other parties.

Efforts to treat mine waste and sewage began in the 1960's and 1970's, and treatment of heavy metals and other toxic waste began in the 1990's. Water

quality has improved in many reaches of the South Fork Coeur d'Alene River and its tributaries, but heavy metal concentrations are high enough to prevent establishment of a fishery in some areas. Concentrations of heavy metals may be inhibiting fish colonization in some areas (Woodward *et al.* 1997).